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Impact of an Oral Protocol on Post Stroke Survivors

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Abstract

Post –stroke survivors are at risk for poor oral health as the provision of oral care is not usually a priority. Few research studies have focused on oral care for post -stroke patients in rehabilitation hospitals. Most oral care research has used samples of patients in intensive care settings, oncology patients, and older adults residing in nursing homes. A standardized protocol for the provision of oral care to post-stroke patients was developed that is being tested for its effectiveness by nurses in a rehabilitation hospital. Using the germ theory of disease, this honor thesis focused on the effects of an oral protocol compared to standard oral care on the incidence of nosocomial infections and pneumonia in post-stroke survivors. A prospective randomized design was used where participants were randomly assigned to either the intervention or control group. Data was collected from each participant for a period of ten days. The nine participants in this study were drawn from the larger study. Six of the participants were in the intervention group and 3 were in the control group. The majority of the participants were females (n=6), Caucasians (n=8), and over 60 years of age (n=6). The revised THROAT assessment tool showed an overall improvement in positive oral outcomes (normal to mild) in the intervention group compared with the control group outcomes (mild-moderate). In both groups, the Mann Assessment of Swallowing Ability (MASA) scores had an overall decline in dysphagia and aspiration severity from Day 2 to Day 10. The Functional Oral Intake Scale scores indicated that most participants had minimal or no restrictions with their diet, except for one participant in the intervention group that was tube dependent throughout the study. The results from the oral cultures indicated that none of the participants were positive for S. *aureus* or MMSA throughout the study. Two were positive for MSSA however converted to negative by the end of the study. None of the participants in either group had any signs and symptoms of pneumonia. These findings are preliminary in determining the effectiveness of the oral protocol intervention in terms of outcomes. No definitive conclusions can be made until the larger study is complete.

Impact of an Oral Protocol on Post Stroke Survivors

Chapter I

Introduction

Post stroke patients are at risk for poor oral health as the provision of oral care is ignored in terms of priorities in nursing care. Post stroke patients often are unable to practice effective oral care (Brady, Furlantetto, Hunter, Lewis & Milne, 2006). According to Vanhook (2009) one of the main disabilities of post stroke patients is the inability to perform basic and or independent activities of daily living. They are a group at risk for infections, particularly nosocomial infections and other complications, such as pneumonia. Little research has explored the effect of oral care protocols or research on preventing nosocomial infections and aspiration pneumonia in post stroke patients. The research on oral care has focused on critically ill patients in intensive care settings, oncology patients, and older adults residing in nursing homes. Few research studies have focused on oral care for post-stroke patients in rehabilitation hospitals (Brady et al, 2006; Jacelon, Pierce, & Buhrer, 2007). Also most of these studies have not compared the effectiveness of standardized protocols for the provision of oral care to post-stroke patients particularly administered by nurses in rehabilitation settings.

Thus the aim of this study was to determine if an oral care protocol administered by nurses in a rehabilitation hospital reduces the incidence of nosocomial infections and pneumonia in post stroke adults. The research questions were:

1. Do post stroke patients that receive an oral care protocol have fewer nosocomial infections compared to post stroke patients that receive standard oral care?
2. Do post stroke patients that receive an oral care protocol have a lower incidence of pneumonia compared to post stroke patients that receive standard oral care?

This study is part of a larger study regarding the impact of an oral care protocol on post stroke survivors (Chipps, Gatens, Genter & Landers, 2007). The purpose of the larger study is to

determine the impact of the adoption of a standardized oral care protocol on nosocomial respiratory infections, oral intake of food and fluids, severity of dysphagia, mucosal colonization with *Staphylococcus aureus* and perceived quality of life among post-stroke survivors with dysphagia in the rehabilitation setting (Chipps, et al).

Chapter II

Literature Review

The literature review for this honor's thesis addresses oral health of hospitalized post-stroke survivors, oral health protocols, and research related to oral health. Germ theory was used to guide the study.

Oral Health of Hospitalized Post-Stroke Survivors

Stroke survivors experience a variety of physical impairments which are both a financial and personal burden and can disrupt oral hygiene. In 2008, the financial cost for individuals who experienced a stroke was estimated to be $65.5 billion and was predicted to exceed $1.25 trillion for Whites, $313 billion for Hispanics and $379 billion for Blacks (Vanhook, 2009). Post-stroke patients may have difficulty swallowing, manipulating and clearing saliva from the oral cavity secondary to motor-sensory deficits (Chipps, et al, 2007). Impaired ability to exit materials from the oral cavity causes ineffective clearance of microbes and debris from the mouth and leads to caries and infections (Talbot, Brady, Furlanetto, Frenkel & Williams, 2005). Furthermore, individuals may have poorly controlled dentures due to alterations in facial muscle mass or movement and sensory problems (Talbot, et al, 2005). Therefore, poorly controlled dentures and impaired swallowing mechanics can lead to poor oral hygiene amongst post stroke individuals. Nutritional supplements which are usually high in sugar, coupled with fluid restriction secondary to swallowing impairments can equally debilitate the oral hygiene of post-stroke patients. Vanhook (2009) mentioned that one of the main disabilities of post stroke patients is the inability to perform basic and/or independent activities of daily living. Mouth washing, tooth brushing and tongue scraping are examples of ADLs that are unable to be routinely carried out, which may lead to oral problems.

Cohn & Fulton (2006) developed a model regarding functional problems and treatment side effects as threats to self-care and oral mucosal integrity of neuroscience patients, including

post stroke survivors. In the model they delineated functional problems and treatment side effects as impacting health of the oral mucosa and inflammation of gingival inflammation. Motor or cognitive deficits, oropharyngeal musculature or swallowing dysfunction, specific medications, and oxygen or suctioning therapies were identified as the four common etiologies of oral mucosa breakdown in neuroscience patients. In the model, motor dysfunction relates to impaired oropharyngeal musculature movement and swallowing. These motor impairments, restricts the oral intake of the neurological patients. The absence of mastication and decreased intake, results in decreased amount of stimulated saliva and microbiological components, which protects the oral cavity from debris and infectious oral microbes. Furthermore, many of the medications neuroscience patients use result in xerostomia. These xerostomia causing medications support mucosal breakdown. The oxygen therapy and suctioning devices equally lead to a xerostomic environment with mucosal injury. These combined effects of removal of secretions and debris, foster an ideal environment for microorganisms growth and healthy tissue degradation. Also, the codependent effects of xerostomia, increased amount of debris, deposition of plaque and growth of infectious microbes results in inflammation and infiltration of these virulent organisms systematically. This model helps recognize the importance of identifying and developing evidence-based nursing interventions that interrupts the process of plaque formation and its consequences.

For a variety of reasons the effects of a stroke may impair oral hygiene (Talbot, et al, 2005). Physical impairment, co-ordination, sensory or cognitive deficits and dysphagia may accompany a stroke and can impact independent oral care. Dysphagia caused by diminished gag reflex and palate movement coupled with decreased mastication has been related as major causes of pneumonia and nosocomial infections (Abe, Ishihara, Adachi & Okuda, 2007; Dougall & Fiske, 2008; Talbot, et al, 2005). Research shows that there is a connection between poor oral hygiene and pneumonia among post-stroke patients. Difficulty with swallowing and inability to mechanically digest food within the oral cavity may result in aspiration of oropharyngeal contents

via the saliva. Saliva is a complex fluid consisting of oral micro flora and their products, mucosal seepage bio-molecules, salivary gland secretions and inflammatory enzymes (Bassim, Gibson, Ward, Pqaphides & DeNucci, 2008). Research studies have shown that dental plaques and tongue coating are breeding sites for respiratory infections (Abe et al., 2008). Therefore, an accumulation of bacteria and inflammatory agents at the time of aspiration may progressively lead to pneumonia.

Hassan et al.'s (2006) study assessed the outcome, microbiological, radiological, laboratory and demographical data of 102 patients with stroke associated pneumonia (SAP), admitted to a hospital setting. Median length of stay for patients with SAP was nine days compared to four days for all stroke patients. Sixty-seven % (n=68) of the patients manifested pneumonia within 48 hours of admission, termed community acquired while the remaining 33 % (n=34) were termed hospital acquired with pneumonia manifesting 48 hours after admission. Infiltrates on chest radiographs were found only in 25 patients and 39 patients had positive cultures of tracheal aspirates. *Pseudomona aeruginosa* and *Staphylococcus aureus* (12 percent each) was the most common organism, followed by *Streptococcus pneumonia* and *Klebsiella pneumonia* (4 percent each). The culture yields were significantly greater in patients with infiltrates on chest radiographs compared to those without infiltrates on chest radiographs. Gender distribution, stroke subtype, frequency of infiltrates on chest radiographs and outcome was comparable between the hospital and community acquired groups. Thirty-four % (n=35) of the patients expired during the hospital stay. Mortality was not related to age, gender, stroke subtypes, and onset latency time, chest radiograph findings, or tracheal aspirate cultures. However, infiltrates on chest radiographs and tracheal aspirate cultures were independent predictors of prolonged hospital stay. Though the participants in this study were classified as either hemorrhagic or ischemic stroke patients, there were no significant relationship between stroke subtypes and risk for SAP.

While some studies have focused on outcomes of acquiring pneumonia in stroke survivors, others focus on identifying risk or screening factors for SAP. Sellar's et al (2007) study, done in Scotland, focused on identifying independent risk factors for chest infection after acute stroke. The researchers claimed that the study was unique as it was the first prospective study of acute stroke patients that focused on identifying risk factors for chest infection. Of the 412 stroke subjects recruited, 78 patients fulfilled the Mann's criteria for pneumonia, 82 were diagnosed as having pneumonia by the attending clinicians but did not fulfill Mann's criteria (suspected pneumonia), 236 had no indications of pneumonia and 8 did not follow up assessment. The subjects were followed up at 3 months after stroke. The dependent variable was Mann criteria pneumonia/no pneumonia; independent binary variables were age (>65 years), COPD, modified National Institutes of Health Stroke Scale (mNIHSS) score >6, modified Rankin Scale (mRS)score $\geq$4, total anterior circulation syndrome, Abbreviated Mental Test (AMT) score 8/10, Logemann swallow assessment score >2, Daniel's swallow assessment score >1, Oral Guide score >10, WST(water swallow test) unsafe or unable, dysarthria or no speech due to aphasia, and blood urea value >8mmol/L. The findings were that older age, speech loss, and severity of post stroke disability, cognitive impairment, and dysphagia were independent predictors of pneumonia after stroke. In addition, dysphagia is an important but not sufficient condition for pneumonia to develop. Sellars et al's (2007) study and other studies confirm that multiple factors with cumulative effects are the foundation for pneumonia in acute and post acute stroke patients. A limitation of this study was that the data for determining chest infection up to 3 months after having the stroke was telephone interviews and a questionnaire. Also the researchers did not differentiate between infections that had a community versus a hospital origin.

The aftermath of stroke includes neurological and physical impairments. These impairments places individuals at risk for many co morbidities including the inability to effectively perform activities of daily living that maintains oral hygiene. Therefore, these individuals are at high risk for oral diseases and other pathophysiological issues related to

unhygienic oral practices. In a Cochrane Systematic review, only one randomized controlled trial that evaluated an intervention specific to stroke patients was found (Brady, et al, 2006). The study compared an oral health care education training program (OHCE) delivered to nursing home care assistants to delayed training intervention in the control group. Comparisons were made at one and six months post intervention measuring the dental and denture plaques of 67 stroke individuals. Data analysis showed that there were statistically significant reduction in denture plaque scores up to six months ($p<0.0001$) after the intervention. Staff knowledge ($p=0.0008$) and attitudes ($p=0.0001$) towards oral care improved. Based on the small number of survivors included in the study and the limited number of studies found in the systematic review, the authors concluded that evidence on oral care interventions related to post-stroke, hospitalized patients is severely lacking.

Cohn and Fulton's (2006) study identified oral care interventions practiced by registered nurses (RNs) and unlicensed personnel caring for neurological patients. Common practices were evaluated based on responses to questions focused on oral products and agents used, frequency of care, documentation of care, patient risk factors, and system support issues such as availability of supplies. RNs reported toothbrush, toothpaste, lip and mouth moisturizer as the most frequently used products. Toothbrush, mouthwash, lip and mouth moisturizer were reported by unlicensed personnel as the most frequent products used. Seventy-nine percent of RNs and 85% of unlicensed personnel reported using foam swabs. Though 93% of RNs and 100% of unlicensed personnel agreed that oral care was an important part of patient care among this population, the frequency of oral care done by 88% of nurses and unlicensed personnel was twice a day, with more unlicensed personnel than nurses reporting providing care before meals and after meals. Unlicensed personnel reported documenting oral care 60% of the time while RNs reported documenting 29% of the time. RNs reported dry tongue, thick, ropey secretions and debris on the tongue as the commonly encountered oral problems by neuroscience patients. Unlicensed personnel identified pain, swollen gums, bleeding gums, dry and crusty tongue, and white patches

on the tongue as oral problems observed among this population that should be reported to nurses. Seventy-three percent of RNs and 67% of unlicensed personnel agreed that neuroscience patients were at risk of developing severe complications related to oral problems. Unlicensed personnel were not asked to identify those complications, while RNs reported fungal infections (100%), aspiration pneumonia (93%), bacterial infections (80%), and airway obstruction (73%) as at-risk complications for neuroscience patients. Eighty percent of RNs and 93% of unlicensed personnel agreed that the oral care supplies were appropriate. The two barriers identified by RNs and unlicensed personnel were limited time to provide oral care and access to an expert in oral care. Though the RNs and unlicensed personnel viewed oral care as an important aspect of these patients' care, the twice a day frequency of care reported is insufficient to maintain oral hygiene among these patients due to their at-risk co-morbidities and complications. Since the study was a self report, no data was available to compare these findings to actual practices. The study did not include questions about oral assessment because no standardized format or instrument was used in the setting. Furthermore, Cohn and Fulton's findings identified the need for introducing oral health educational resources and tools into hospitalized institutions to fill in the knowledge gaps and deficits common among many health care officials.

Oral Protocols

The identification of the multiple risk and causative factors associated with acquiring pneumonia in stroke survivors, regardless of demographic factors, has been the focus of some studies, providing different oral care protocols to either treat or prevent pneumonia. However, there is inconclusive evidence about oral care protocols specific to stroke survivors depending on what parameters are being measured or targeted. Furthermore, provision of an oral health protocol is an area that nurses can play an important role in interventions that may make a difference in the health of individuals, particularly with patients that have chronic illnesses (Munro, Grap, Jablonski & Boyle, 2006).

Stiegel, Damon, Sowers and Velez's (2000) evaluated a research-based policy and protocol to improve oral hygiene care of intubated and critically ill patients. Critical care nurses were assigned the key role of implementing the protocol and assessing the impact of the procedure. They were trained before and during the intervention protocol. The sample was comprised of 16 patients. The assessment included evaluating the condition of voice, swallow, lips, palate, cheek, gums, tongue, saliva, teeth, and mouth odor pre- and post- intervention. The intervention involved a baby toothbrush, toothpaste, and normal saline for patients with teeth. A foam stick was used for edentulous patients to provide moisture and to clean the patient's gums. Recommended frequency was every two hours but no longer than every six hours. The posttest total score was significantly different from the pre-test, with significant improvements in the swallow, condition of lips, palate, cheek, gums, teeth or dentures and mouth odor. Despite the successful outcome of the study, the participants may not be a valid and reliable representation of the larger society due to its small sample size.

Munro, et al (2006) did a systematic review of previous studies regarding the measurement of salivary factors, dental plaque, oral microbial flora and standardized oral measures, which are available and applicable across population, and their relationship to nursing research and patient outcomes. Munro et al. used The University of Mississippi Oral Hygiene Index to assess the volume of stimulated and unstimulated saliva, the immune and other microbiological components of saliva, the amount of dental plaque in oral cavity and the use of microbial techniques to identify microorganisms present in sputum and plaque in the studies. The conclusions from the systematic review were that even though there is a commonality in oral health interests, measures and procedures must be selected based on the research question, the operational definition of oral health, and population of interest.

Another study focused on an oral hygiene intervention done by oral hygiene aides and itsrelationship with incidence of mortality from pneumonia in a nursing home setting (Bassim, et al., 2008). It involved patients in two wards that have been randomly assigned to the intervention

by oral hygiene aide performing the oral care, while patients in the other two wards were the control group that received the usual oral care. The oral care intervention involved tooth brushing, antiseptic mouthwash use, and oral and denture cleaning for edentulous or partially edentulous residents for dependent residents. Those participants resistant to care were encouraged and provided at least a mouthwash and toothettes. Suction assisted toothettes, with a tooth brushing and swabbing action and dilute hydrogen peroxide were used to provide oral care to ventilated, unconscious or aspirating residents, with the bed elevated to at least 30 degrees, to prevent aspiration.

The data for Bassim et al.'s (2008) study was a longitudinal analysis of the medical records of the143 residents in the four wards. Initially the intervention group showed approximately the same incidence of mortality from pneumonia as the control group. However, when the data were modified for age, functionality, cognitive function, and clinical concern about aspiration pneumonia, the probability of dying from pneumonia in the group that did not receive oral care was more than three times greater than of the group that did receive oral care (odds ratio = 3.57, P = .03). The oral hygiene aides performed a non unified oral care protocol which could be dependent on the individual competence of the aide. The researchers recommended that additional studies be done using this intervention to determine if obtain similar results.

Other Research Pertaining to Oral Health

Despite the few research studies on oral health in post-stroke survivors, some research has been done regarding critically ill patients in intensive care units, patients living with cancer, and geriatric patients in long terms care facilities. These studies have been inconclusive and minimal in number.

Patients in the Intensive Care

Ganz, et al. (2009) conducted a survey, in Israel, describing current oral-care practices of Intensive Care Unit (ICU) nurses with patients. The objectives were to determine whether these

routines were innovative evidence-based practices (EBP) and if the practices were related to demographic characteristics of the nurses. Convenience sampling was used to obtain 218 participants. The survey addressed oral care equipment, solutions, and procedures used by the nurses and demographic information of the participants. The most commonly reported equipment used in oral care included gauze pads (84%), tongue depressors (55%) and toothbrushes (34%). Chlorohexidine was the most common solution used (75%). In terms of practices, 44% of the nurses reported brushing their patient's teeth, 71% reported performing a pre- oral care assessment, and however, none were able to describe the assessment tool used. Only 57% of the nurses reported documenting their oral care. In terms of intubated patients only 44% of the nurses rated oral care as a priority. All participants indicated that there was no known written oral protocol on the units they worked. The use of EBP oral care was not related to any of the demographic (age, gender) or professional (nursing education, years of ICU experience, type of ICU, post-basic ICU certification, work full or part time, and shifts worked) characteristics. The researchers' concluded that ICU nurses needed to be educated regarding EBP oral care and needed to use these practices to improve the health of patients in intensive care settings. The study findings emphasize the importance of formulating and use EBP protocols in practice.

Furr, Binkley, McCurren and Carrico (2004) investigated the relationship between nurses' background, attitudes, and perception of hospital factors and the quality of oral care in ICUs. Also the study focused on determining predictors of the quality of oral care. Data was obtained from a national random sample of nurses (n=556) who completed a short 27-item questionnaire. The findings indicated that oral care education, adequate time, assigning high priority to oral care and perceiving oral care to be unpleasant, as factors directly affecting the quality of oral care delivered by nurses. The quality of oral care was not associated with years of experience in ICUs, oral care supplies, or equipment provided. The researchers contended that the facilitators and barriers to oral care in intensive care units as being multi-factorial and multifaceted interventions are needed to improve oral care nursing practices that may to reduce

the incidence of pneumonia in mechanically ventilated patients. Despite the positive results of this study, similar studies are needed to validate the findings of this study and its application.

Fields' (2008) examined ventilator-associated and other nosocomial pneumonias that accounted for 15% of all hospital-associated infections in the ICU and represent the second most common hospital associated infection. Recent evidence has shown that pneumonia increases the mortality, morbidity and estimated cost of living of patients. Furthermore, studies have shown that comprehensive oral care was a vital way of reducing infection rates among ICU patients by removing oral pathogenic organisms from the oral cavity. Fields' study was a performance improvement project evaluating the effect of implementing the Institute of Healthcare Improvement's (IHIs) VAP bundle and an oral care protocol on the incidence of VAP in stroke ICU patients.

The IHIs VAP bundle included (a) elevating the head of the bed of ventilated patients to 30^{o}, (b) preventing venous thromboembolism with the use of sequential compression devices or anticoagulant, (c) administering gastric acid antihistamines, (d) practicing good hand hygiene, (e) initiating early mobilization, and (f) performing daily sedation interruption at 10 am for evaluating neurological status. The stroke patients were randomly assigned to the intervention and control group with both patients receiving the VAP bundle interventions. The oral care protocol received by the intervention group were (1) change yankauer suction every 24 hours, (2) oral assessment every 12 hours, (3) toothbrush teeth, tongue and palate with toothpaste every 8 hours, (4) toothettes to swab teeth, tongue and palate every 8 hours, (5) moisturize the lips and suction mouth and pharynx as needed. On the other hand, the control group received the "usual oral care" implemented on the unit. Assessment findings and implementations were documented on a formulated worksheet. Post intervention findings showed a drop in VAP rate to 0% per 1,000 ventilator days in the intervention group which was sustained for 6 months. The positive findings of this study resulted in a consecutive drop in the control group and an inclusion of all intubated patients in the study. Despite the positive outcomes of this study, there was inadequate

documentation by the nurses on the worksheet as only 200 of the 345 patients had complete documentation. Furthermore, the kits used in this study were additional unit expenditures which were offset by the decrease in VAP. The oral practice of teeth-brushing, a simple nursing technique, was validated as an important tool for preventing pneumonia in the critically ill (Fields, 2008).

Cancer

Oral toxicity and complications are common and unavoidable side effects of many cancer treatments. Immune suppression coupled with direct damage of the oral mucosa and glands by chemotherapy and radiotherapy results in research supported problems such as oral mucositis, xerostomia and oral opportunistic infections (Miller & Kearney, 2001). Furthermore, oral complications can negatively effect the patients' quality of life and nutritional status (Potting Uitterhoeve, Scholte, Reimer & Van Achterberg, 2006; Miller & Kearney, 2001). Therefore, strict oral hygiene may be detrimental to preventing exacerbation or incidence of these side effects among oncology patients. Miller and Kearney's systematic review of literature critiqued 20 relevant research studies of oral care for patients with cancer that included oral assessment, equipment required for providing oral care, frequency of oral care, mouthwashes, and saliva substitutes and stimulants used for patients with cancer. Oral assessment guides were identified as useful tools for accurate description of the oral cavity. Since the proper application of these oral assessment tools to clinical practices showed an increased awareness of oral problems and positive patient's oral outcome in cancer patients. Furthermore, adequate lighting, observation and palpation are additional skills to use during the assessment phase of the mouth. Recommended equipment for providing oral care in oncology patients was a small, soft-headed toothbrush to prevent accumulation of dental plaque. However, tooth brushing can be contraindicated for oncology patients with thrombocytopenia due to their increased risk of spontaneous bleeding. The alternative device for thrombocytopenic patients was identified as foam swabs, which cause fewer traumas to the oral tissue, potentially stimulate saliva production

and improve vascularity through the gentle massaging effect. Other simple and cost effective items commonly used for oral care were toothpaste and water. Though the frequency of oral care delivery widely varied, the level of acuity of the patients was the primary determinant of the frequency. The lack of specific and detailed guidelines that accurately direct the implementation of oral care among these patients' warrants the need for extensive research focused on this health problem. A non-irritating and non-dehydrating mouth wash was selected as being appropriate for oral cleaning; however, no mouthwashes were specified as being suitable for oral care. There was limited evidence to support the effectiveness of chlorhexidine, hydrogen peroxide, sodium bicarbonate and sodium chloride as a suitable mouthwash for oncologic patients. Miller and Kearney (2001) explained that saliva substitutes can be effective in maintaining comfort by relieving xerostomia in cancer patients there is limited research that supports the efficacy of their use as an antibacterial and immunologic agent. Miller and Kearney's conclusions were that need to use different oral care based on the patient's symptoms and medications and that nurses need to provide education about oral care to these patients.

Potting, et al. (2006) studied the efficacy of commonly used mouthwashes in preventing chemotherapy-induced oral mucositis. Their systematic review showed that chlorhexidine was an ineffective agent for preventing oral mucositis compared to sterile water, 0.9% saline solution or sodium bicarbonate. The teeth discoloration, the bitter taste and the unpleasant sensation caused by chlorhexidine use makes it an unsuitable mouthwash. Furthermore, the alternative mouth rinses are less expensive and readily available. The other mouth solutions chamomile and nystatin had no effect on mucositis prevention. Only one study in the review, with a small sample size, supported the use of iodine solution as an effective mouthwash. Potting et al. recommend more studies be done to determine the efficacy of iodine solution. They contend that can not recommend use of chlorhexidine and other mouthwashes to prevent oral mucositis based on their review.

Older adults/nursing homes

The progressive decrease in physiological adaptability and homeostasis associated with the aging process can increase older adults' susceptibility to oral pathologies. Jablonski, Munro, Grap, and Elswick (2005) explored the multifactorial areas of health that can synergistically increase older adults vulnerability to oral complications. Their study evaluated the impact of biobehavioral aging, nursing home environments, and health care insurance policies on the oral health disparities in frail and functionally dependent elderly nursing home residents. A dental survey of 1,063 nursing home residents reflected poor oral hygiene in 72% of dentate residents and 15.4% of edentulous individuals. Jablonski et al. explained the increased risk of dentate older adults to oral problems is related to receding of the gum to expose the teeth roots as aging progresses. The tooth roots are highly sensitive and susceptible to plaque developments, tooth caries and other dental diseases. Many older adults are on multiple treatment medications, which have xerostomic effects. These effects can decrease salivary production, thereby altering the ability of older adults to fight against oral pathogens. Seventy percent of the nursing home residents were cognitively impaired, which made them functionally or mentally unable to independently provide mouth care. Additionally, nursing assistants, the least educated of the nursing staff, performed the majority of the physical care, including oral care, at the extended care facilities. Furthermore, Jablonski et al. elicited the effects of Medicaid and Medicare insurance policies on dental care among older adults. With 85 percent of all nursing home residents, mostly older adults receive both Medicare and Medicaid, and only 20% of community based older adults in the United States having private insurance. The overall health status of the older adult population is highly dependent on the coverage offered by Medicare and Medicaid that offer dental coverage as a supplemental insurance. Also, the dental coverage provided by both federally funded insurance is only limited to emergent and not preventive care of oral health. The low Medicaid reimbursement equally limits older adults' access to dental care. Jablonski et al. study primarily supported the interaction between the vulnerability of nursing home residents to

oral health problems and the social, economic, psychological and physiological factors that can result in this effect.

Jensen, Saunders, Thiere, and Friedman (2008) identified predictors of oral health-related quality of life (OHRQOL) among functionally dependent older adults. Four hypotheses were formulated from prior related studies. Three of the four hypotheses that less life satisfaction, low income, and living alone would be associated with poor OHRQOL were not validated, while worse oral health, health, and disability status were partially verified to be associated with poor OHRQOL. Though prior studies detected a strong correlation between oral health and risk factors for anxiety, depression, and other psychiatric symptoms, an association was not found in this study. Large populations of older adults are covered by Medicare or Medicaid; Jensen et al. (2008) expressed the need for research focusing on identifying the correlation between the limited dental coverage provided by Medicare or Medicaid and emergent oral disorders among older adults. Clinical implications of this study indicated that equal emphasis must be placed on identifying physiological and non-physiological (individual perceptions and psychosocial status) parameters that affect oral status.

Talbot et al (2005) used a questionnaire to investigate the oral care policy and procedures provided by 70 health care units to post-stroke older adults. They found that only 15 of the 70 units used an oral care protocol. More than 25 units had no access to toothbrushes, toothpaste or chlorhexidine. Oral care and support were only provided if the patient was functionally dependent or the oral problem had manifested. Furthermore, the frequency of providing oral care to patients varied across the units. Talbot et al. concluded that the low prioritization placed on oral care by health care providers and the absence of a universal oral protocol to guide hospital practice and prevent oral complications.

Yoneyama, et al. (2002) conducted a randomized study to compare the efficacy of oral care in reducing pneumonia among older adults in 11 Japanese nursing homes. The sample was comprised of 416 patients who were followed for two years. The specific oral protocol received

by the intervention group were daily and after meal tooth brushing without dentifrice (toothpaste), including brushing the palate, mandibular mucosa and the tongue dorsum. If tooth brushing was not effective in removing debris, the oropharynx was scrubbed with an applicator of one percent povidone iodine. On the other hand, the control group assumed normal oral care routine. Results showed that the relative risk (RR) for patients who did not receive oral care compared with those receiving oral care was 2.45. New cases of pneumonia were 19% in the control group compared to the intervention group (11%). The relative risk for death related to pneumonia for the control compared to the treatment group was 2.40. Activities of Daily Living and Mini mental status examination scores were related to improvement with oral care. Fewer edentate patients in the oral care group had febrile days or pneumonia. These findings show that frequent and routine oral care provided beneficial effects among this sample of older adults by decreasing the incidence of pneumonia, an example of an oral complication.

Sjogren, Nilsson, Forsell, Johansson and Hoogstraate (2008) did a review of randomized control trials and non-randomized studies related to oral hygiene and infection in older adults. The randomized control trials showed positive preventive effects of oral hygiene on pneumonia and respiratory tract infection in hospitalized elderly people and elderly nursing home residents, with absolute risk reductions from 6.6 to 11.7% and numbers needed to treat ranging from8.6 to 15.3 individuals. The non randomized control studies showed inconclusive evidence on the association and correlation between oral hygiene and pneumonia or respiratory tract infections in elderly people. Sjogren et al concluded that the findings from the review support mechanical oral hygiene as a preventive method to decreasing mortality from pneumonia, and non-fatal pneumonia in older adults. Also they contended that approximately one in 10 cases of preventable death from pneumonia in elderly nursing homes residents by improving oral hygiene.

Germ Theory

Germ theory was used to study the effect of an oral care protocol on reducing the incidence of nosocomial infections and pneumonia in post-stroke patients. The germ theory of

disease was coined as early as 1546 by Girolomo Fracastoro in his “de Contagione” treatise that microscopically free-living organisms were causative agents of diseases and can be transmitted easily from person to person or from person to formite (clothing, towels, utensils, etc) (Opal, 2009). Despite its early existence this theory was not extensively validated until works by Louis Pasteur and Joseph in 1862. These studies included the discovery of attenuating pathogens to decrease the pathogenicity of microbes and sterilization techniques. Since, the mid 80’s this theory has been used in epidemiological findings and prevention of cholera, anthrax, tuberculosis and other communicable diseases. Though not all disease causing microbes of pneumonia are communicable, the germ theory validates the existence of microorganisms that lead to different strains of the infection. Solomkin (2006) used qualitative and quantitative cultures obtained from either bronchoscopic or blind catheter lavage or mini-brushing to identify the disease causing microbes of ventilator-associated pneumonia; and monitoring the efficacy of the drugs to prevent microbial resistance patterns. This study and others confirm the viability of the germ theory of disease. The germ theory was used as the framework for this study of the impact of an oral protocol on post-stroke survivors in a rehabilitation hospital. The overall incidence of Staphylococcus aureus, MRSA, and pneumonia would be determined in the study for those participants who received the oral protocol and those participants who received the usual oral care.

Chapter III

Methods

The aim of this study was to determine if an oral care protocol administered by nurses in a rehabilitation hospital reduces the incidence of nosociomial infections and other complications in post stroke older adults. The research questions were:

1. Do post stroke patients that receive an oral care protocol have fewer nosocomial infections compared to post stroke patients that receive standard oral care?
2. Do post stroke patients that receive an oral care protocol have a lower incidence of pneumonia compared to post stroke patients that receive standard oral care?

Design

A prospective randomized control design was used. This honor's thesis is part of a larger study regarding the impact of an oral care protocol on post stroke survivors (Chipps, et al, 2007). Participants in the larger study are randomly assigned to either the intervention or control group. Each participant is in the study for a total of 10 days. In the larger study, the number of participants expected to be recruited is a total of 52 with 26 in each group to account for attrition. A power analysis indicated that 21 participants per group were needed to provide 80% power for the test at an alpha level of .05 (Chipps, et al).

Sample

The sample for the honor's thesis was anticipated to be at least 10 participants from the larger study. This number was chosen as recruitment had been slower than anticipated. Potential participants admitted to the rehabilitation hospital did not meet the criteria of dysphagia.based on their scores on the Mann Assessment of Swallowing Abilities (Mann, 2002).

Inclusion criteria included: being newly admitted to the acute rehabilitation hospital; able to communicate in English and can give informed consent; primary diagnosis of a stroke within 30 days of admission to the rehabilitation unit; admitted directly from an acute care facility;

documentation of oral and/or pharyngeal dysphagia. Exclusion criteria were current co-morbid diagnosis of pneumonia; known infection of the oral cavity and/or receiving therapy for infection of the oral cavity; documented history of a hematological disorder; medically restricted fluid intake; allergic to Listerine or other mouth care products; currently wearing dentures; or history of Methicillin Resistant *Staphylococcus aureus* (MRSA)(Chipps, et al., 2007).

A potential participant was screened by a member of the research team within 24 hours of admission. The two research team members who did the screening, consenting, and the assessments were master's prepared nurses who are employed in the rehabilitation facility were the study is being done. If the individual met the eligibility criteria, the study was explained and asked if would like to be in the study. The individual was asked to complete the IRB consent form and HIPPA document. If the individual did not want to be in the study, the individual was thanked for taking the time to listen about the study.

Human Subjects

The research protocol for the larger study was approved by The Ohio State University Institution Review Board, Biomedical Human Subjects Committee (Chipps, et al, 2007). An amendment was approved for the honor student to be added to the study as key personnel. She worked with the investigators by collecting and coding data from the participants' records.

Procedure

Participants were randomized to either the intervention or control group. In both groups one of the research team did an oral assessment at baseline and every third day. These research team members had participated in training to establish inter-rater reliability of their oral assessments. Participants in the intervention group received the oral care protocol twice a day for 10 days. This involved timed tooth brushing with a battery powered brush, tongue brushing, mouth rinsing with Listerine, and lip and mouth lubrication. Some of the nurses in the rehabilitation hospital had been trained on how to do the protocol by some of the investigators and a dental consultant. The control group received routine oral care that is provided to patients

on the unit. A member of the research team obtained oral cultures from each participant at baseline, Day 5, and Day 10 to be tested for Staphylococcus *aureus* and Methicillin Resistant St*aphylococcus aureus* (MRSA) (Chipps, et al., 2007).

Measurement/Instruments

THROAT

Prior to beginning the study, several of the nurses involved with the study piloted a revision of the THROAT that was derived from the original instrument (Dickson, Watkins & Leathey, 2001; Chipps, et. al (2007). The changes were designed to make the tool simpler to use in doing the oral assessment. After piloting the instrument the decision was made to use it in the larger study. There is no reliability data available for the revised THROAT being used when this study was conducted. Reliability and validity analysis is in process by the investigators of the larger study.

The revised THROAT consists of seven parameters which are lips, gums, teeth, tongue, saliva, smell, and mouth discomfort. Each measure is rated on a scale of 1-3 with a score of 3 indicating an orally compromised cavity. The overall score is a sum of the 7 categories. Scores can range from 7 to 21. A score of 7 indicates normal oral assessment, a score of 14 indicates mild to moderate oral issues and a score of 21 would indicate several oral issues. The THROAT assessment is performed at Day 2, Day 6, and Day 10 by one of the members of the research team who is unaware if the participant is in the intervention or control group.

Oral Cultures

Swabbing of the oral cavity was used to obtain samples for oral cultures. One of the research nurses obtained the sample by swabbing the oral cavity of each participant at baseline, Day 5, and Day 10. Each culture was sent to the same laboratory for microorganism analysis and identification. By using the same laboratory all samples were analyzed with the same protocol to detect the presence of S. *aureus* and Methicillin Resistant St*aphylococcus aureus* (MRSA).

Mann Assessment of Swallowing Ability (MASA)

The Mann Assessment of Swallowing Ability (MASA) was used to determine if the potential participant met the dysphagia criteria to be in the study (Mann, 2002). Also the MASA was used to measure if there were changes in the level of dysphagia while in the study. The MASA is a tool specific to neurologically acquired dysphagia patients comprised of 24 clinical items. These items assess the subjects' oromotor/ sensory components of swallowing, quality of swallow, dietary recommendations and predictive risk rating on swallowing integrity. A score of less than 178 out of a possible 200 reflects probable to definite dysphagia. In contrast, a score of less than 170 indicates risk of aspiration. Reliability of the MASA has been obtained on a sample of stroke patients. The Cronbach's alpha correlation coefficient was 0.917. Using the kappa statistics, the inter-observer agreement of this tool has been calculated as (good) 0.82 for dysphagia and (moderate) 0.75 for aspiration (Mann, 2002). The MASA was done at Day 2 and Day 9 by one of the research team, who was blinded to the participant being in the intervention or control group.

Functional Oral Intake Scale (FOIS)

The FOIS was used to determine changes in oral intake of food and liquid. This assessment tool is specific to stroke patients with dysphagia (Crary, Carnaby-Mann, & Groher, 2005). The scale is rated on scale of 1-7 with level 1 indicating nothing by mouth to level 7 indicating an optimal outcome of no oral diet restrictions. With a sample of stroke patients, the reported inter-rater agreement had perfect agreement on 85% of the ratings. The Cohen K statistic ranged from 0.86 to 0.91. Crary et al concluded that the FOIS is a reliable and sensitive tool to detect changes in functional oral intake. The assessment was performed by the research team at Day 2 and Day 9.

Data Analysis

Information collected from the participants' clinical records was used to describe the sample of this study. This information included age, sex, race, and medical history, scores on the

THROAT, MASA, and FOIS. Descriptive statistics of frequencies and percentages were used in the analysis due to the small number of participants in each group. Also these same statistics were used to address the two research questions.

Research Question #1: Do post stroke patients that receive an oral care protocol have fewer nosocomial infections compared to post stroke patients that receive standard oral care?

Research Question #2: Do post stroke patients that receive an oral care protocol have a lower incidence of pneumonia compared to post stroke patients that receive standard oral care?

These two questions addressed differences in the incidence of S. aureus, MRSA, and pneumonia between the control and intervention group. The oral culture results and daily documentation on signs and symptoms of pneumonia were used to address these questions.

Chapter IV

Results

Sample

The anticipated sample size was not attained due to trouble recruiting post-stroke patients who met the study criteria. Recruitment of participants began in July 2009 and concluded at the end of May 2010. No additional participants were added to the study after that date due to the pragmatics of the honor student graduating in June 2010. The larger study is continuing to recruit participants. During the first six months of the study only two individuals met the criteria. The final sample for the honor's thesis was 9 participants. Six of the participants had been randomly assigned to the intervention group and the other three to the control group.

Demographic Characteristics

All of the participants were post stroke patients that consented to be in the study within 24 hours of being admitted into a rehabilitation hospital in Ohio. The ages of the participants ranged from 42 to 80 years, with a mean age of $\geq$ 71 years of age (n=5, 55.56%) and a median age of 72 years. The majority of participants were over 60 years of age (n=6, 66.7%), female (n=6, 66.67%), and Caucasians (n=8, 88.89%). The most prevalent past medical diagnoses, in addition to the stroke, were hypertension (n=6, 40%) and other related cardiac complications (n=3, 20%) such as mitral valve stenosis, coronary arterial disease and congestive heart failure. Table 1 presents the background characteristics for the entire sample of the participants.

Table 1: Demographic Characteristics of the Sample

Characteristics	N	%
Age		
40-50	3	33.33
51-60	0	0.00
61-70	1	11.11
≥71	5	55.56
Gender		
Female	6	66.67
Male	3	33.33
Race		
African-American	1	11.11
Caucasian	8	88.89
Group		
Intervention	6	66.67
Control	3	33.33
Past Medical History *		
Hypertension	6	66.67
Hyperlipidemia	2	22.22
Diabetes mellitus	2	22.22
Other cardiac complications	3	33.33
Alcohol use	1	11.11
Drug use	1	11.11

*Does not include the stroke diagnosis and some participants had more than one previous health problem

Participants were randomly assigned into the intervention (n=6, 66.67%) and .control (n=3, 33.33%) groups. There was an equal sample distribution of age and gender between the two groups, with the majority being female (66.67%) and 51-80 years of age (66.67%).The majority of participants were Caucasian (n=5, 83.33%) in the intervention group while all the participants in the control group were Caucasian. Table 2 presents the demographic information of the intervention and control group.

Table 2: Demographic Characteristics of the Intervention and Control Groups

Characteristics	Intervention Group (N=6)		Control Group (N=3)	
	N	%	N	%
Age				
40-50	2	33.33	1	33.37
51-80	4	66.67	2	66.67
Gender				
Female	4	66.67	1	33.37
Male	2	33.33	2	66.67
Race				
African-American	1	16.67	3	100.0
Caucasian	5	83.33	0	0.0

Clinical Characteristics

It is important to consider the participants scores on the assessment measures related to their oral health status. Data from the THROAT, Mann Assessment of Swallowing Ability (MASA), and Functional Oral Intake Scale (FOIS) was considered in terms of the total sample and the two groups in terms of the results.

Revised Throat

The revised THROAT assessment tool was used to measure changes in oral assessment outcomes between the two study groups. At day 2, 83.33% (n= 5) of the intervention group and all the control group subjects had a "mild to moderate" rating for oral assessment. By day 6, 50% (n= 3) of the intervention group where either rated as "normal to mild" or "mild to moderate" while the control had 66.67% (n=2) and 33.33% (n=1) of the participants within the "normal to mild" and "mild to moderate" range respectively. All the participants in the control group had similar oral outcomes in day 9 and day 2, while the intervention group had 66.67% (n=4) within the "normal-mild" range and 33.33% (n=2) as rating in the "mild to moderate" in the oral assessment by day 9. These ratings indicate an overall improvement in the positive oral outcomes within the intervention group compared to the control group (See Table 3).

Table 3: THROAT Results for Intervention and Control Group Participants

Variable	Intervention Group (N=6)		Control Group (N=3)	
Throat Day 2	N	%	N	%
Normal-Mild	1	16.67	0	0
Mild-Moderate	5	83.33	3	100.00
Moderate-Severe	0	0	0	0
Throat Day 6				
Normal-Mild	3	50.00	2	66.67
Mild-Moderate	3	50.00	1	33.33
Moderate-Severe	0	0	0	0
Throat Day 9				
Normal-Mild	4	66.67	0	0
Mild-Moderate	2	33.33	3	100.00
Moderate-Severe	0	0	0	0

MASA

The MASA was used to assess each participant's dysphagia and aspiration severity scores based on their numerical rating. Two-thirds (66.67%) of the participants (n=4) in the intervention group had a dysphagia score that was in the mild-moderate category at day 2 and 33.3 % (n=2) had a score that was in the mild category. In comparison, in the control group 66.67% (n=2) had scores in the mild category and the other participant (33.33%) (n=1) score was in the severe category for dysphagia. At day 10, 83.33% (n=5) of the intervention participants were in the minimal dysphagia category and the other participant was in the moderate dysphagia category. In contrast, 66.67% (n=2) of the control group remained in the minimal dysphagia category and the other participant's dysphagia improved as moved from the several to moderate category.

On the aspiration assessment scale of the MASA, the intervention group had 33.33% in the minimal range, 50% in the mild and 16.67% in the severe range at day 2. While in the control group, 66.67% were in the minimal aspiration and 33.33% were in the severe form of aspiration. This was the same participant who was initially in the severe dysphagia range. By day 10, 83.33% of the intervention group was in the minimal aspiration category while the control group

had 66.67% in this category. Furthermore, both the intervention and control participants that were in the severe aspiration at Day 2 were now in the mild aspiration category. Both groups elicited to an overall decline in dysphagia and aspiration severity from Day 2 to Day 10 of the study. (See Table 4).

Table 4: MASA Results for Intervention and Control Group Participants

MASA	Intervention Group (N=6)		Control Group (N=3)	
	N	%	N	%
MASA Day 2 Dysphagia				
Minimal	2	33.33	2	66.67
Mild	0	0	0	0
Moderate	4	66.67	0	0
Severe	0	0	1	33.33
MASA Day 10 Dysphagia				
Minimal	5	83.33	2	66.67
Mild	0	0	0	0
Moderate	1	16.67	1	33.33
Severe	0	0	0	0
MASA Day 2 Aspiration				
Minimal	2	33.33	2	66.67
Mild	3	50.00	0	0
Moderate	0	0	0	0
Severe	1	16.67	1	33.33
MASA Day 10 Aspiration				
Minimal	5	83.33	2	66.67
Mild	1	16.67	1	33.33
Moderate	0	0	0	0
Severe	0	0	0	0

FOIS

The Functional Oral Intake Scale was used to assess oral-feeding abilities and restriction within the two groups. At day 2, 16.67 % (n=1) participant in the intervention group was at level 2 indicating maximal tube dependent feedings, 66.67% (n =4) were at a level 5 eliciting to the

presence of oral restrictions with multiple consistencies and special preparation of oral intake; while 16.67% (n=1) was rated as having minimal limitations to oral intake and diet. The control group had 66.67% (n=2) with moderate oral restrictions in consistencies and 33.33% (n=1) with optimal oral intake at day 2.

By day 9, 60% (n =3) of the intervention participants were at level 7 the optimal oral intake while the remaining two were either tube dependent (level 2) or had minimal oral diet restrictions (level 7). One of the participants in the intervention group was not included in the FOIS analysis for day 9 due to missing data. On the other hand, 66.67% (n=2) in the control group had no oral restrictions in diet while 33.33% (n =1) had moderate oral diet restrictions. These results indicate an overall decrease in oral restrictions in both groups except for the intervention participant that remained at a level 2 through the duration of this study. (See Table 5).

Table 5: FOIS Results for Intervention and Control Group Participants

FOIS	Intervention Group (N=6)		Control Group (N=3)	
	N	%	N	%
Functional Oral Intake Day 2				
Level 2	1	16.67	0	0
Level 5	4	66.67	2	66.67
Level 6	1	16.67	0	0
Level 7	0	0	1	33.33
Functional Oral Intake Day 9				
Level 2	*1	20.00	0	0.00
Level 5	0	0.00	1	33.33
Level 6	1	20.00	0	0.00
Level 7	3	60.00	2	66.67

*Missing data for one participant in the intervention group

Research Questions

Research Question #1: Do post stroke patients that receive an oral care protocol have fewer nosocomial infections compared to post stroke patients that receive standard oral care?

Results from the oral culture were used to detect the presence of S. *aureus* and MRSA within the oral cavity of each participant. Most of the participants in the intervention (83.33%) and control group (66.67%) tested negative for the presence of both microorganisms at baseline. The exception at day 1 was one participant in the intervention group that tested positive for the presence of Methycillin Sensitive *Staphylococcus aureus* (MSSA). Also, one participant in the control group tested positive for MSSA at day 1. By day 5, all the participants in the control group were negative for the presence of all the microorganisms including MSSA, while 16.67% (n=1) of the intervention participants was still positive for the presence of MSSA. By day 10, all participants in the study tested negative for the presence of S.*aureus*, MRSA and MSSA. Based on these results, the nosocomial infection causing-microorganism that was detected at day 1 and day 5, was absent by day 10 in both groups. None of the participants were positive for *S. aureus* for any of the three times the cultures were tested. (See Table 6).

Table 6: Oral Culture Results for Intervention and Control Group Participants

Oral Culture	Intervention Group (N=6)		Control Group (N=3)	
	N	%	N	%
Day 1				
Negative	5	83.33	2	66.67
MMSA Positive	0	0.00	0	0.00
MSSA Positive	1	16.67	1	33.33
Day 5				
Negative	5	83.33	3	100.00
MMSA Positive	0	0.00	0	0.00
MSSA Positive	1	16.67	0	0.00
Day 10				
Negative	6	100.00	3	100.00
MMSA Positive	0	0.00	0	0.00
MSSA Positive	0	0.00	0	0.00

None of the participants in the intervention or control group were positive for S.aureus and MRSA. One participant in the intervention group was positive for MSSA at baseline and day

5, however became negative by day 10. One participant in the control group was positive for MSSA at baseline but became negative by day 5. In conclusion, all 9 participants were not positive for S.*aureus* and MRSA.

Research Question #2*: Do post stroke patients that receive an oral care protocol have a lower incidence of pneumonia compared to post stroke patient that receive standard oral care?*

Daily documentation of the participants' lung assessment and vital signs were used to determine related signs and symptoms of pneumonia in both groups. None of the participants from either group had any signs and symptoms of pneumonia at baseline through day 10.

Discussion

The randomization of participants in the study resulted in more participants being in the intervention group. The characteristics of the sample were similar in each group with respect to age and gender. Two-thirds of the participants in each group were 51 years of age or older. Thus, most of the participants can be categorized as older adults, which reflects the national demographics of stroke prevalence (Jablonski et al., 2005). Furthermore, the prevalence of females as the majority of participants is supported by national statistical distribution on the prevalence of stroke within this gender and females living longer than males.

The change in the intervention group from 16.67% at day 2 to 66.67% by day 9 having normal-mild ranking in the oral cavity assessment, reflect an overall improvement in oral hygiene. However, all the control participants showed no overall change in oral hygiene as all had mild-moderate rating in oral outcome at day 2 and 9.The improved oral hygiene in the intervention group may indicate an overall decline in complications related to poor oral status (Steifel, Damon, Sowers & Velez, 2000).

With respect to dysphagia severity, the intervention group had 66.67% with moderate dysphagia at day 2 and 83.33% with minimal dysphagia by day 10, indicating a decline in severity over the course of the study. In contrast, the control group had 66.67% with minimal

dysphagia at day 2 and day 9, indicating that most of these subject had a less severe form of dysphagia compared to the intervention group at baseline.

The intervention group showed an overall decline in aspiration severity with an increase in the percentage of subjects with minimal aspiration from 33.33% to 83.33%. 66.67% of the control subjects had minimal aspiration at day 2 and day 10, therefore indicating no overall change in aspiration severity throughout the duration of the study.

The fact that there was an increase from a level 5 to level 7 among 66.67% of the control group and 60% of the intervention group on the FOIS scale, showed a significant progression to optimal oral diet constituency. It is important to note that the FOIS rating for one participant within the intervention group was missing for day 9, which may have impacted the FOIS results obtained for this study.

Presence of S *aureus* and MRSA was detected in neither groups, however, one participant in the intervention group tested positive for the presence of MSSA at baseline and day 5, while one participant in the control group tested positive for MSSA only at baseline. By day 10 the presence of any microorganism causing nosocomial infection was not detected in these participants' oral culture results. Further analysis may be required to investigate the relationship between MSSA and nosocomial infections. Furthermore, no signs and symptoms related to pneumonia in the two groups were found. Results from this study are preliminary. The larger study may find different results. The sample was too small to test for statistical significance between the two groups.

This study had some strengths and limitations that may have impacted the results. Strengths included the similar sample distribution between the intervention and control group with respect to age and gender, the sample being a representative of national statistics in the prevalence of stroke among the female older population, being a randomized sample, the use of instruments that have been used in other studies and had acceptable reliability data. Randomizing the participants into the control and intervention group and blinding the investigators reduced bias

in the research design. The fact that the majority of participants were female and older adults and reflected the high prevalence of stroke among these individuals

The limitations include a small sample size, the short duration of the study and the limited diversity of the sample. The duration of this study may have limited the ability to detect pneumonia manifestations within the time frame allocated. Furthermore, the 10 days for the intervention may have been too short to identify significant changes between the groups. Though the results are primarily preliminary in findings, the sample size of 9 total participants limits the application and generalization of the result findings from this study to a larger population group. The sample was predominantly Caucasian, older adults, and females.

Conclusion

This study is part of a larger study to evaluate the impact of an oral care protocol on stroke survivor's health in regard to nosocomial infections and pneumonia The findings from this sample did not find any differences between the intervention and control group participants. This may be attributed to sample size and duration of the oral protocol. Different results may be found when the larger study is completed that has a sample that meets the number needed based on the power analysis.

The outcomes from the larger study indicate the need for educating nurses within the health care setting about oral care being a priority in caring for a patient, thereby decreasing health care costs related to oral complications within this study's population group. In addition, institutionalizing policies within the health care and clinical practices that ensure proper implementation and maintenance of oral hygiene, will optimally improve the oral health status of stroke patients.

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